

CLAIMS

1. An apparatus for operating one or several gates or the like (U), comprising a pressure generating unit, which can be mounted in or on the ground and is provided with restoring springs (O) and is designed, by a hydraulic circuit system, to actuate an opening and closing mechanism for a gate or the like, characterized in that said cylinder (A) is designed as a primary compression cylinder, which is hydraulically connected to partly an accumulator tank (C), which is designed to accumulate a portion of the force as an overpressure, and partly a secondary opening cylinder (D), which is designed to open the gate (U) against the force of a closing spring (V), in that the overpressure in the liquid is to be released through a duct to an expansion tank (B) through a check valve (H), which is designed to delay the discharge process in such a way, that it will have an effect only subsequent to the passage of e.g. a car past the apparatus and the gate and to the start of the reduction of the overpressure in the expansion tank, and in that possible pressure peaks from very heavy cars and the second and the third axle respectively of a car are to be released directly through an overpressure valve (I) back to the expansion tank.

2. An apparatus according to claim 1, characterized in that the apparatus comprises a lock mechanism, which is designed to lock the gate in a closing position and to be inactivated in an initial phase by the opening movement, particularly by including a lock plunger in said hydraulic circuit.

3. An apparatus according to claim 1, characterized in that a pressure generating unit normally is mounted on each side of a gate (U) on and/or in the ground, and/or in that it comprises a stationary exterior box (M) having spider legs (N), which provide improved stability by a fastening in the ground by means of fastening bolts or the like, in that inside the upwardly open exterior box an inverted vertically movable interior box (P) is telescopically mounted, compression springs (O) extending between the bottoms of the two boxes, and in that one or several hydraulic compression cylinders (A) extend between

the bottoms of the boxes, which cylinders contain a frostless liquid, e.g. water and glycol, to make the unit operative between -30°C and $+60^{\circ}\text{C}$.

4. A apparatus according to claim 3, characterized in that said hydraulic cylinders are fastened to the bottom of the stationary box, whereas their plunges are designed to be pressed against the inner side of the bottom of the movable box, thresholds (S) suitably being provided on the upper side of said bottom, said thresholds being designed to detect and establish a running over-position, and in that ramp plates (Q) are articulately fastened to e.g. the upper/interior box near its bottom, which ramp plates are to lead a car wheel to said upper side.

5. An apparatus according to any of claims 1-4, characterized in that the secondary opening cylinder (D) is mounted on a holder (W), which is its turn is mounted on e.g. an existing fencing stake (X) in a pivotable way in order to, during the opening and closing process respectively, itself find the right angle in relation to a force arm (Y), in that the cylinder (D) lies in a plane above the holder (W) and the force arm (Y) in its turn lies in a plane above the cylinder (D), the opening cylinder being able to freely move in relation to the holder (W), while the force arm is able to freely move in relation to the opening cylinder (D), and in that the force arm (Y) suitably is shaped like a boomerang in order not to collide with the stake (X), it being designed to pass round the stake in order to also facilitate the mounting.

6. An apparatus according to any of claims 3-5, characterized in that the gate (U) is designed to be closed against the second existing stake (Z) having a contact surface or stop (\AA), in such a way, that, when the gate has been opened and e.g. a car has left the pressure indicator unit, the springs (O) will press the interior box back to its upper starting position and create an underpressure in the primary compression cycle, which will draw back liquid from the expansion tank in such a way, that the primary cylinder will be ready to start the entire operative cycle again and in the secondary cylinder the pressure will be reduced, since liquid will return to the expansion tank through the check valve (G), the closing spring being able to function and close the gate slowly, since liquid will be pressed out of the secondary opening cylinder and through the check valve back to the accumulator tank.

7. An apparatus according to any of claims 1-6, characterized by an aerator (L) in the duct branch to the accumulator tank (C), an aerator (M) in the duct branch to the opening cylinder (D), check valves (E and F) in two duct branches from the pressure side of the compression cylinder (A), a manometer (J) connected after the check valve (F) in the branch, and an aerator (K) connected to the same branch.

8. An apparatus according to any of claims 3-7, characterized in that the entire pressure generating unit is enclosed, the enclosure downwards being made of a reinforced plastic fabric in order to be able to simply spread it out, and the pressure generating unit upwards being covered by a steel net-reinforced rubber mat in order to partly seal against moisture and dirt and to partly withstand tens of thousands of approaching and leaving runs of cars and/or in that the exterior rigid metal box is provided with four spider legs, which have holes in their outermost corners, through which holes long bolts will be inserted, which will be fastened in the ground, or long screws, which will be fastened in plugs or the like in looser ground.

9. An apparatus according to any of claims 3-8, characterized in that the movable box is provided with a number of roller bearings, which solely allow vertical movements within the rigid box, or ball bearings or simply Teflon-coated surfaces, and/or in that the pressing downwards of the interior box will be facilitated by a run by a car on the ramp, one end of which is movably inserted into the box, which ramp is fastened in such a way, that its fastening to the loose box remains at the same point, seen in the direction of travel of the car, whereas the other end of the ramp moves a short distance backwards in relation to the direction of travel of the car, the loose box being pressed downwards and the ramp lying more parallel to the ground.

10. An apparatus according to any of claims 1-9, characterized in that the pressure generating unit is manufactured as a first module, which by means of two plastic hoses partly transfers the operative pressure to the secondary opening cylinder and partly returns hydraulic liquid from the expansion tank to the primary compression cylinder, when an underpressure occurs in it, when a car has left the pressure generating unit and the interior box is pressed upwards by the restoring springs, in that the accumulator tank, the pressure meters, the check valves, the overpressure valve and their connections and attachments are manufactured as a second module, which can be placed in a box, which can be

fastened to a gate stake or the like, and in that the secondary opening cylinder with its holder, valve and power arm is manufactured as a third module, which preferably will be mounted on an existing stake in order to handle an existing gate.

11. An apparatus according to any of claims 1-10, characterized in that the apparatus also comprises three measure/aeration points (2), a manometer (5), a check valve (21), a pressure limiting valve (23) and a manual opening valve (25), in that, when the gate is closed, the piston stem in the cylinder (D) will be actuated by the basic pressure in the accumulator (B), plus the force of spring (V), in that the piston stem (A) will be actuated by the basic pressure in the accumulator (B), and in that the gate will be hydraulically locked through a pilot-guided check valve (25).

12. An apparatus according to claim 11, characterized in that in order to carry out a manual opening the valve (25) will be opened manually by means of a bar in such a way, that, when the gate is opened, liquid will flow partly through the check valve (21c) to the negative side of the cylinder (D) and partly because of an equalization of the differential area to the accumulator (B), in that after a manual opening of the gate the gate will be closed automatically, because the same pressure exists on both sides of the piston in the cylinder (D), in that the force of the spring (V) and the area difference in the cylinder (D) will result in the closing, and in that, when a manual opening is carried out, the force, required for an automatic closing, will be loaded.

13. An apparatus according to claims 11 and 12, characterized in that for an automatic opening, when the cylinder (A) is run over by a car, pressure and flow will pass through the check valve (21a), in that the gate will start its opening through the choking (Ha), in that the effect will be loaded into the accumulator (C), at the same time as pressure and flow start decreasing through the choking (Hb), the choking (Ha) having a dimension so much larger than (Hb), that a complete opening of the gate will have time to occur and will remain for a certain time, before the discharge will have an effect, and in that at the same time as the gate is opened, the cylinder (D) will enter into a negative position, the hydraulic medium on the positive side of the cylinder jointly with the accumulator (B) being designed to fill the cylinder (A), in that the pilot valve (25) then is kept open by the pressure from the negative side, in that the apparatus also comprises an overload protection, since the valve (23) will be opened at a pressure above 10 bars, and in that a repeated load on

the cylinder (A), before the operative cycle has been concluded, will result in, that the overpressure and the excess liquid will be emptied through the valve (23).